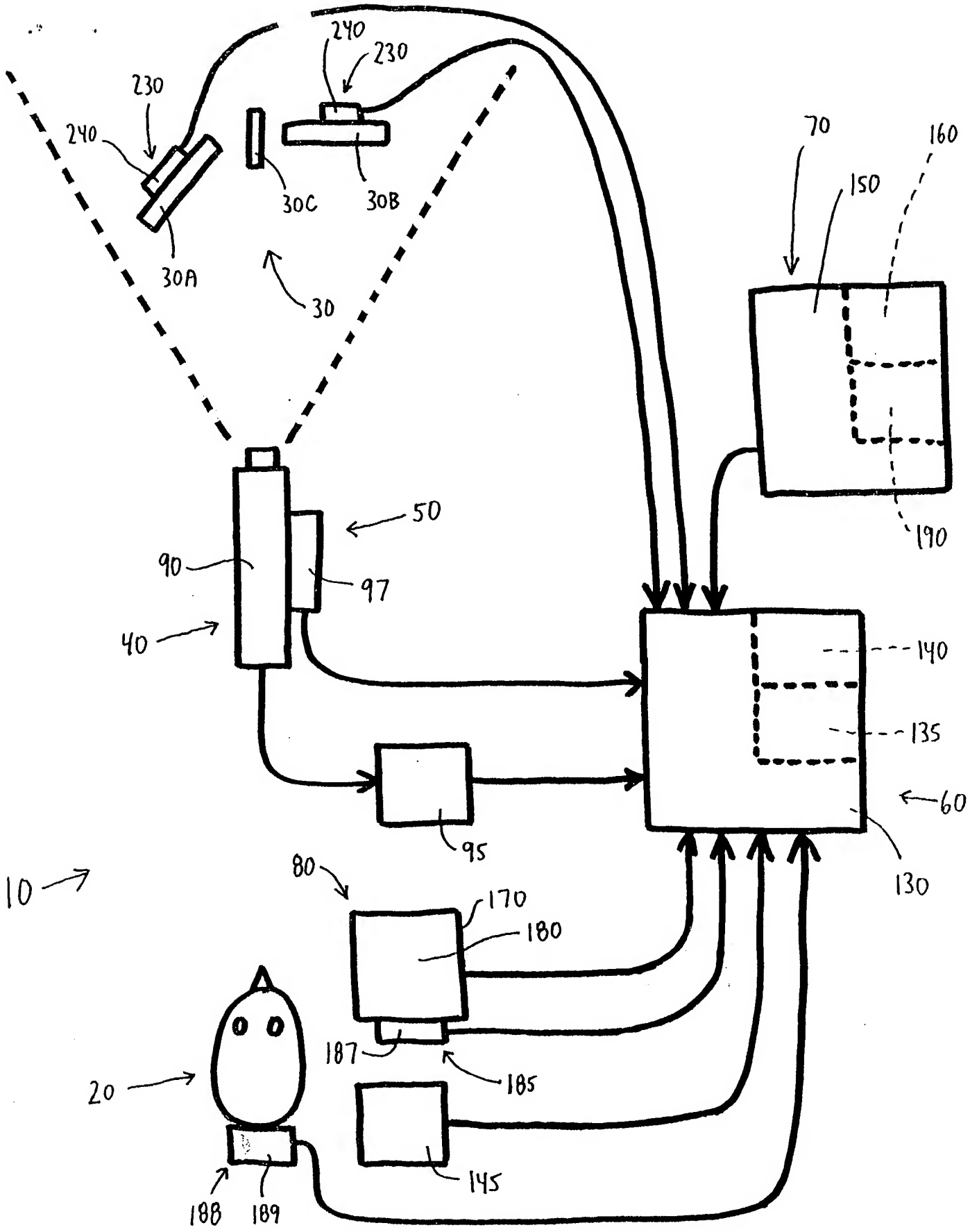

240
230
230
240
30C
30B
30A
30
70
160
150
190
50
90
97
40
140
135
60
95
130
10
80
170
180
187
185
20
145
188
189

FIG. 1

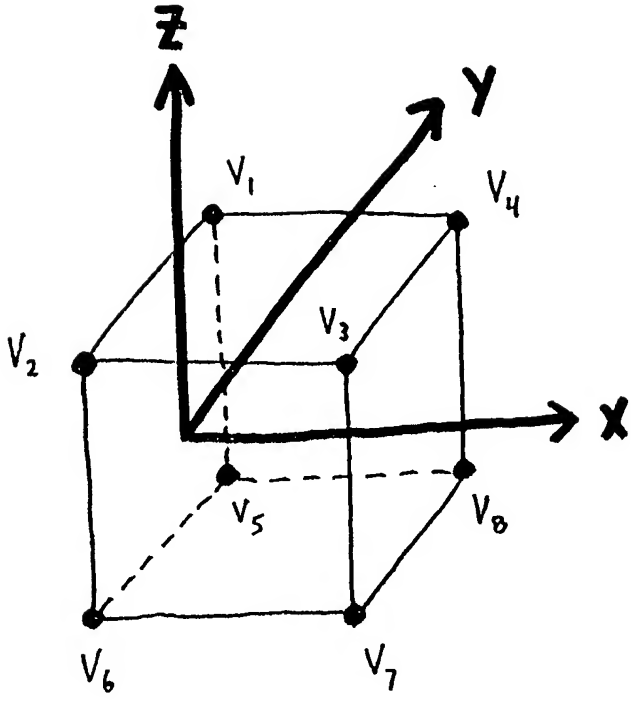


FIG. 2

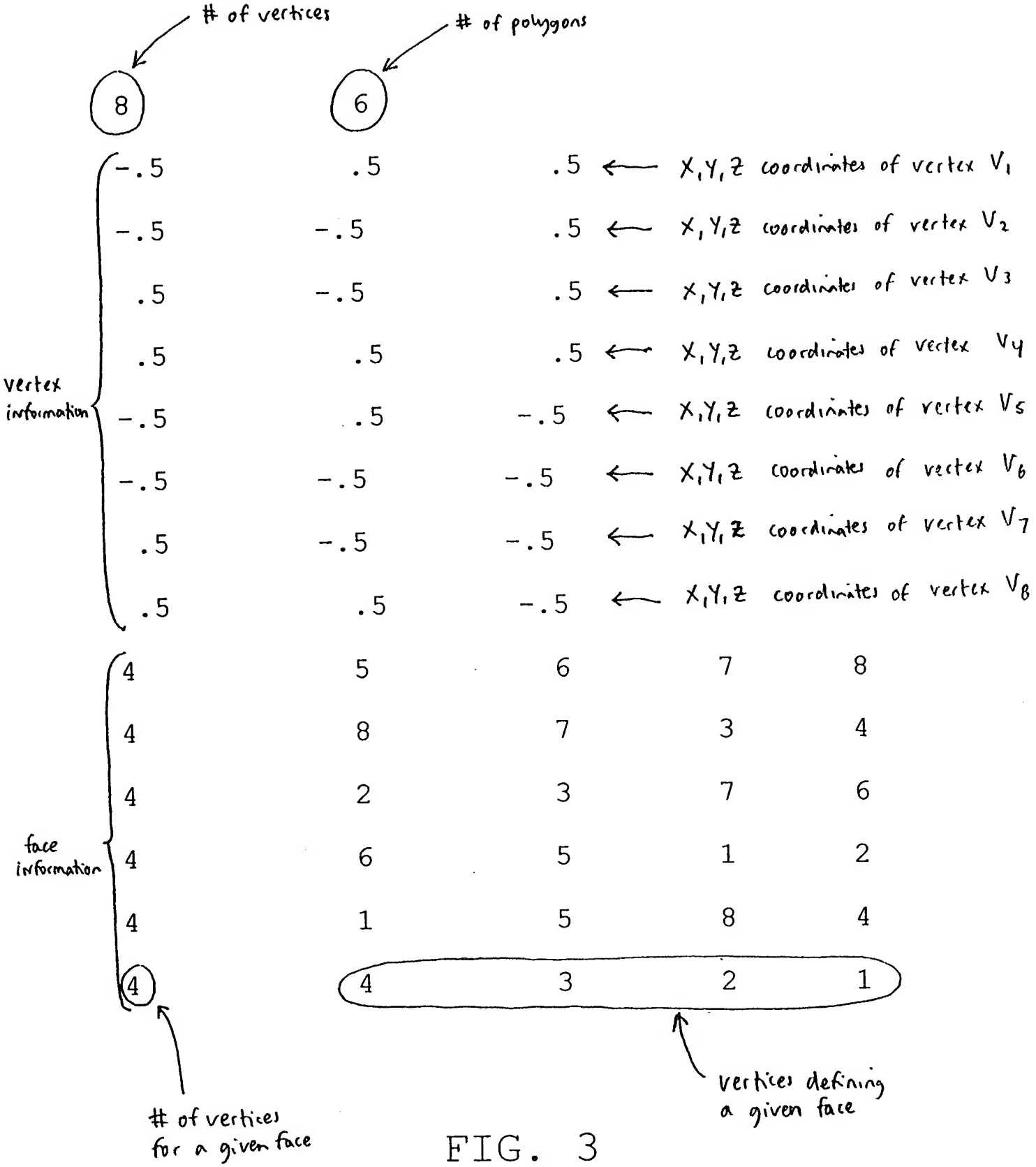

# of vertices
# of polygons
8
6
-.5 .5 .5 ← X,Y,Z coordinates of vertex V1
-.5 -.5 .5 ← X,Y,Z coordinates of vertex V2
.5 -.5 .5 ← X,Y,Z coordinates of vertex V3
.5 .5 .5 ← X,Y,Z coordinates of vertex V4
-.5 .5 -.5 ← X,Y,Z coordinates of vertex V5
-.5 -.5 -.5 ← X,Y,Z coordinates of vertex V6
.5 -.5 -.5 ← X,Y,Z coordinates of vertex V7
.5 .5 -.5 ← X,Y,Z coordinates of vertex V8
vertex information
4 5 6 7 8
4 8 7 3 4
4 2 3 7 6
4 6 5 1 2
4 1 5 8 4
4 4 3 2 1
face information
# of vertices for a given face
vertices defining a given face

FIG. 3

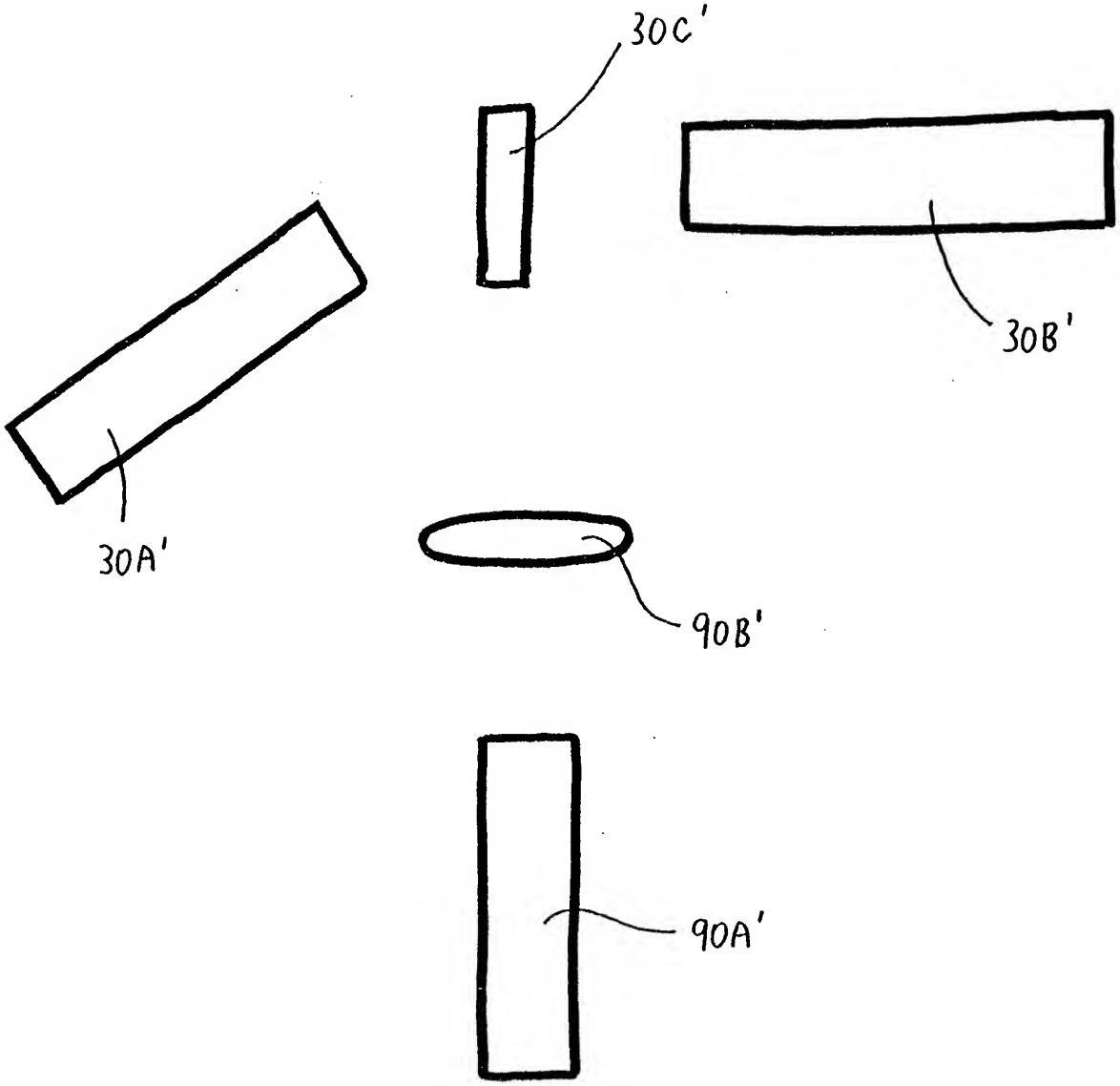


FIG. 4

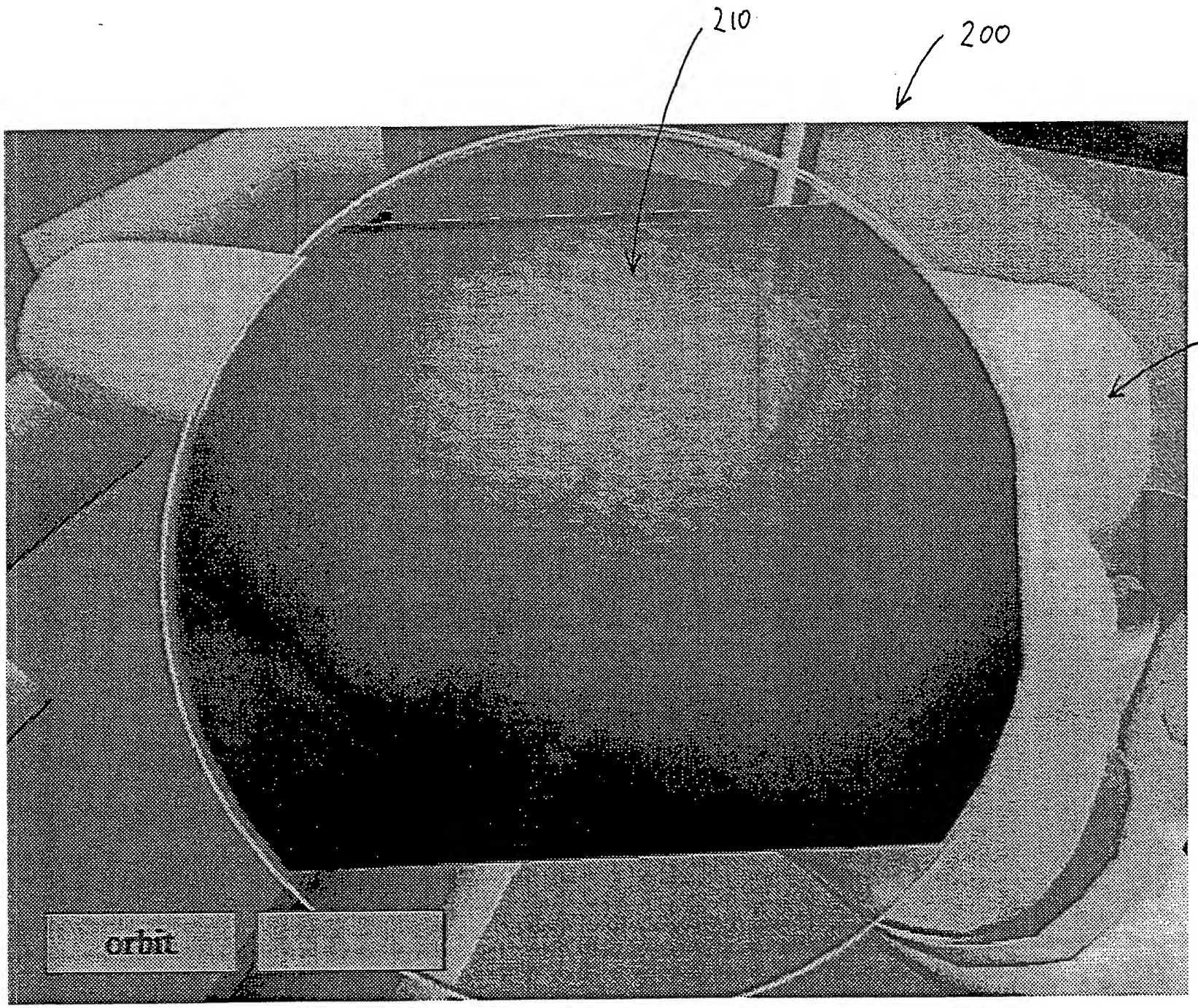


FIG. 5

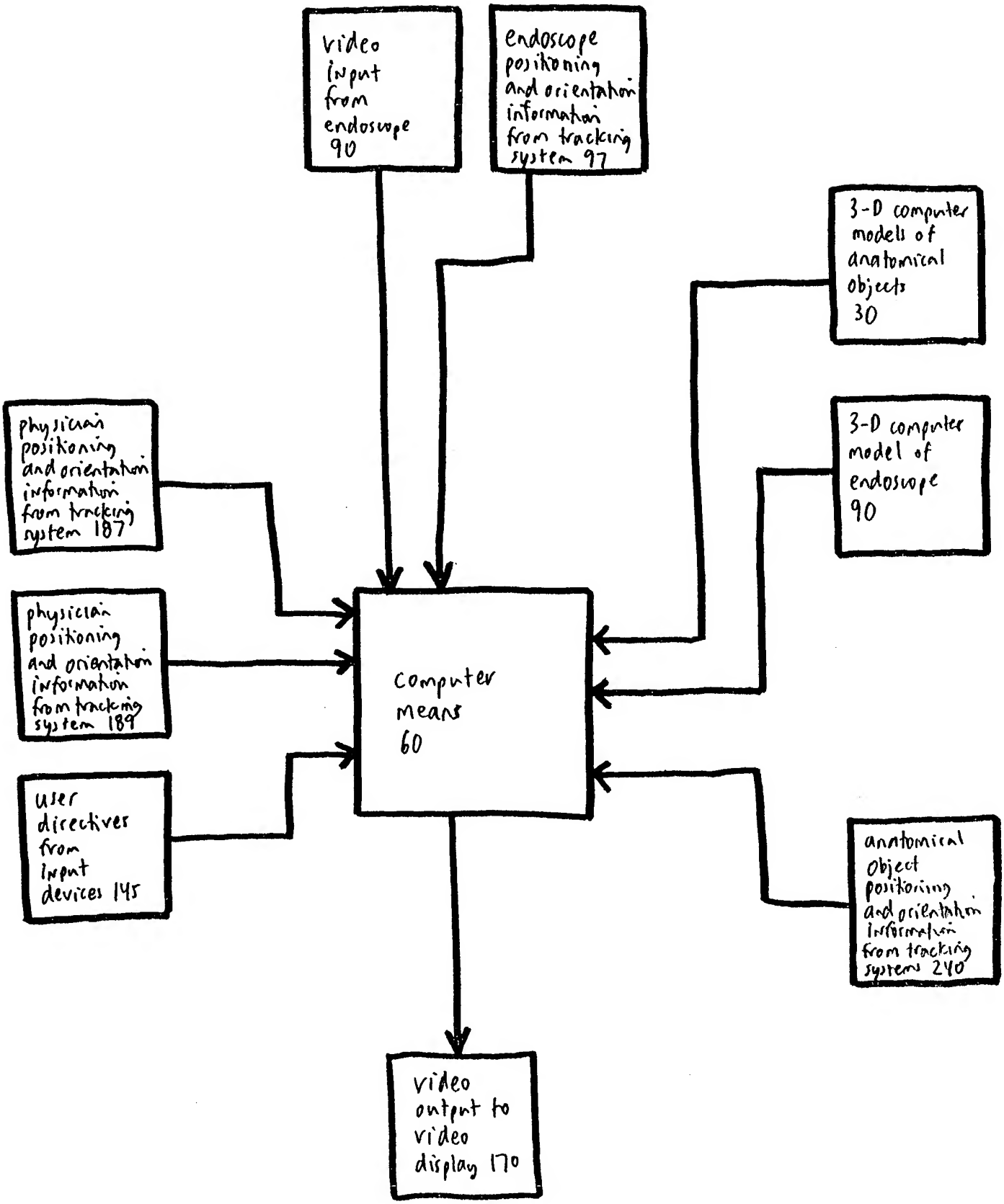

video input from endoscope 90
endoscope positioning and orientation information from tracking system 97
3-D computer models of anatomical objects 30
physician positioning and orientation information from tracking system 187
3-D computer model of endoscope 90
physician positioning and orientation information from tracking system 189
computer means 60
user directives from input devices 145
anatomical object positioning and orientation information from tracking systems 240
video output to video display 170

FIG. 6

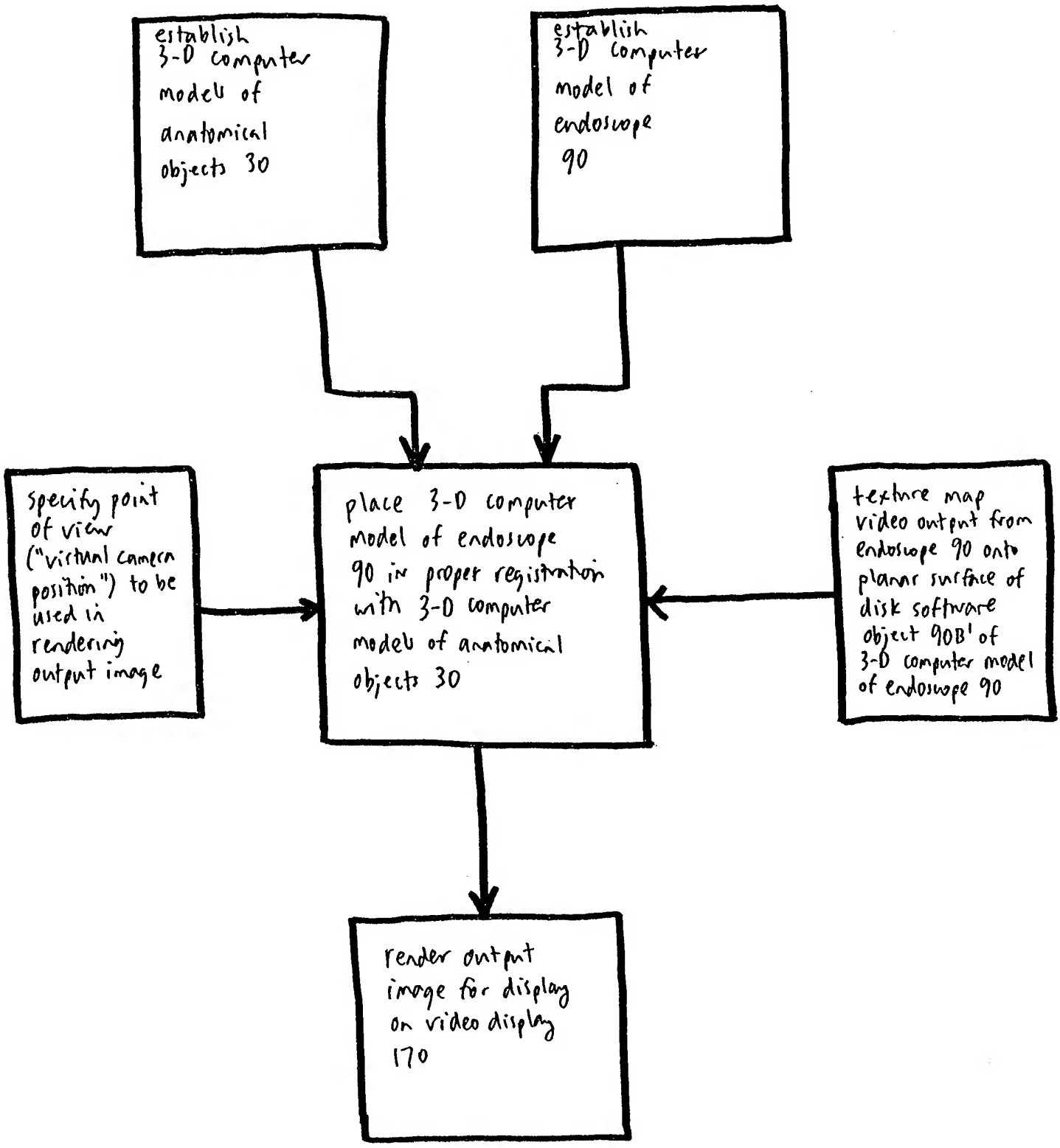

establish 3-D computer model of anatomical objects 30
establish 3-D computer model of endoscope 90
specify point of view ("virtual camera position") to be used in rendering output image
place 3-D computer model of endoscope 90 in proper registration with 3-D computer model of anatomical objects 30
texture map video output from endoscope 90 onto planar surface of disk software object 90B' of 3-D computer model of endoscope 90
render output image for display on video display 170

FIG. 7

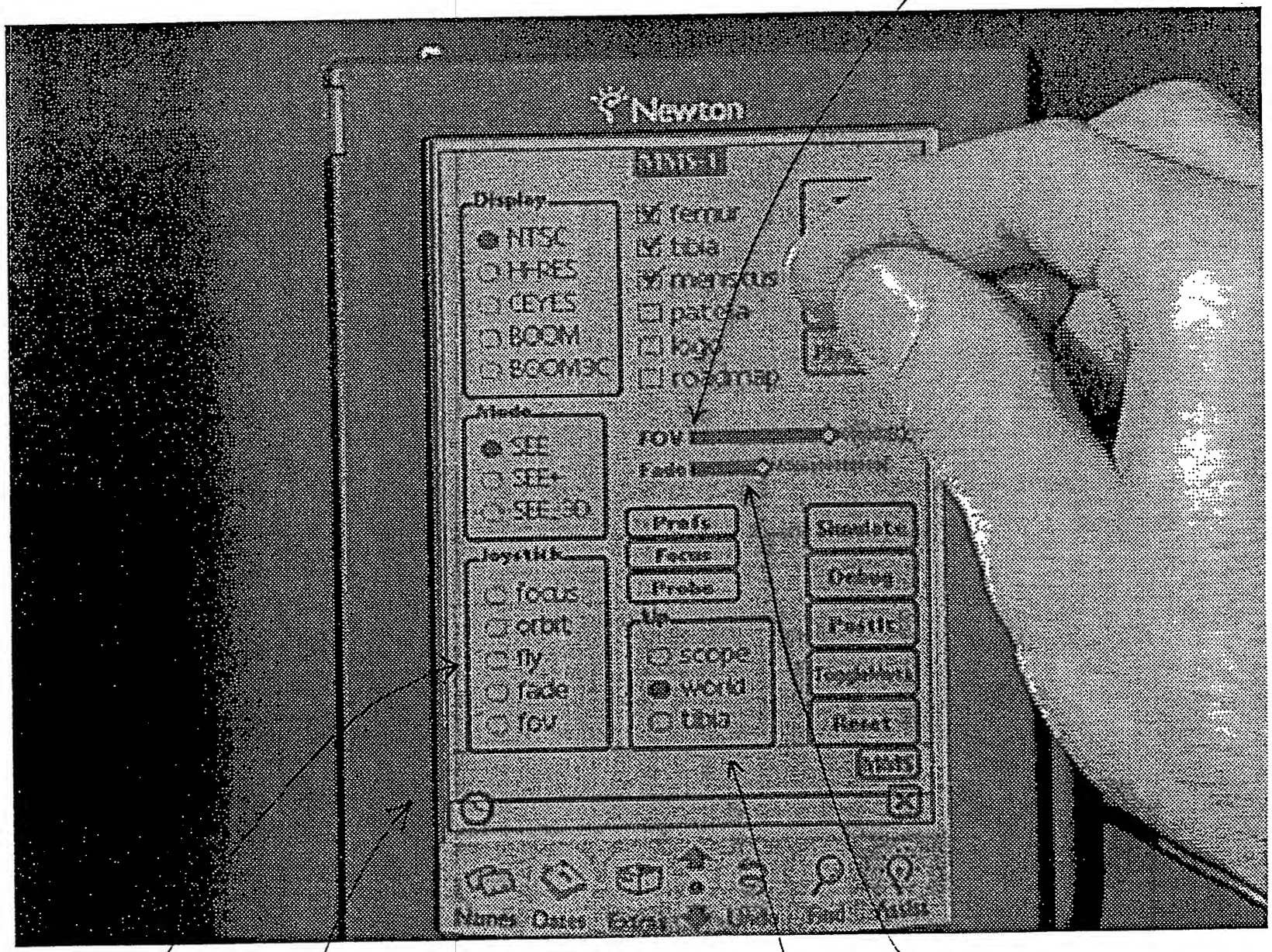

Newton
Display
NTSC
HI-RES
CEYLS
BOOM
BOOMSC
ferrur
tota
metrics
patch
key
roadmap
Mode
SEE
SEE+
SEE_SO
rov
fade
Keyskin
focus
orbit
fly
fade
rov
Prefs
Focus
Probe
Up
scope
world
data
Steadicam
Debug
Psycle
Keyskins
Reset
Names
Dates
Events
Undo
Find
Wands
360
310
300
380
370

FIG. 8

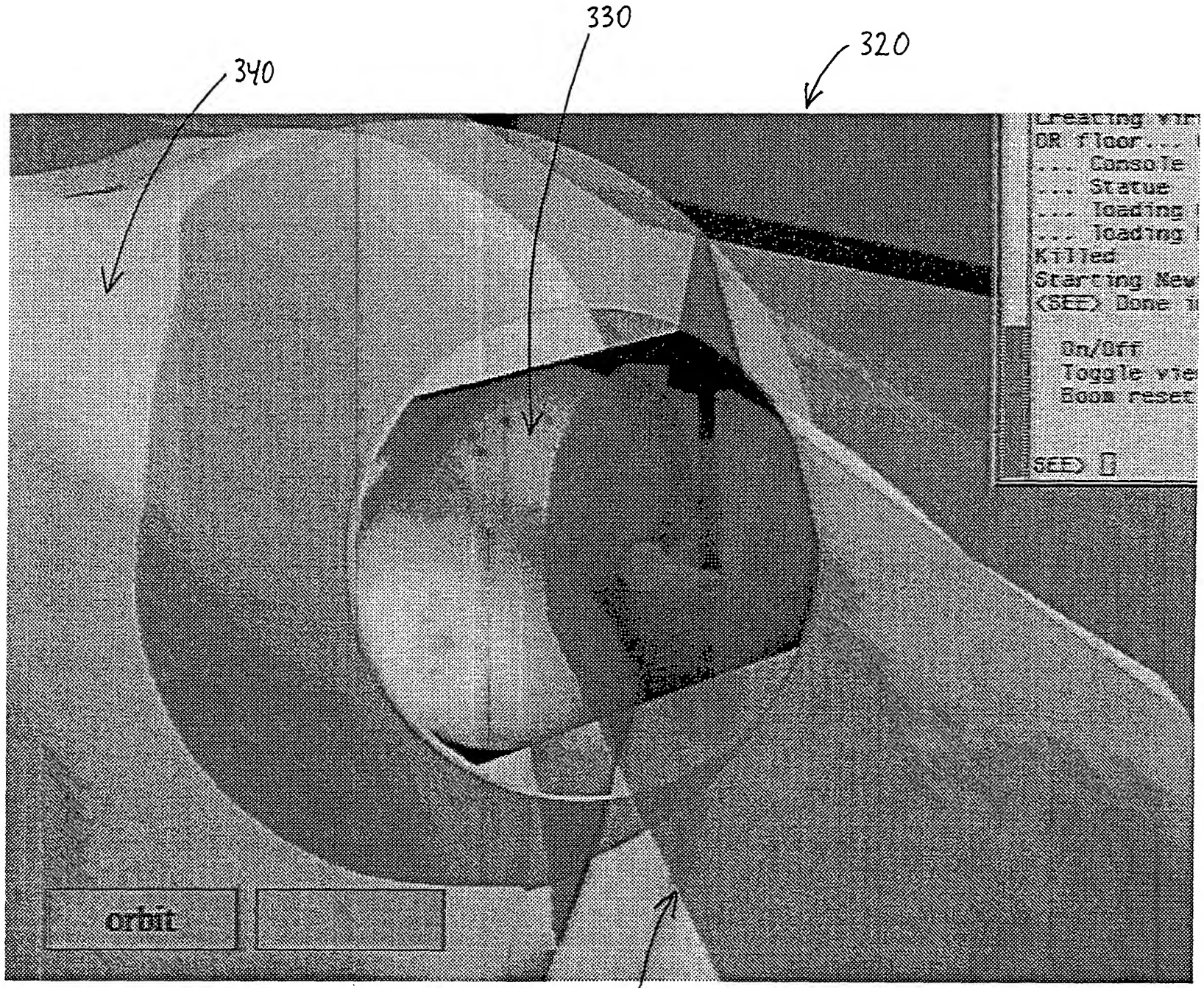
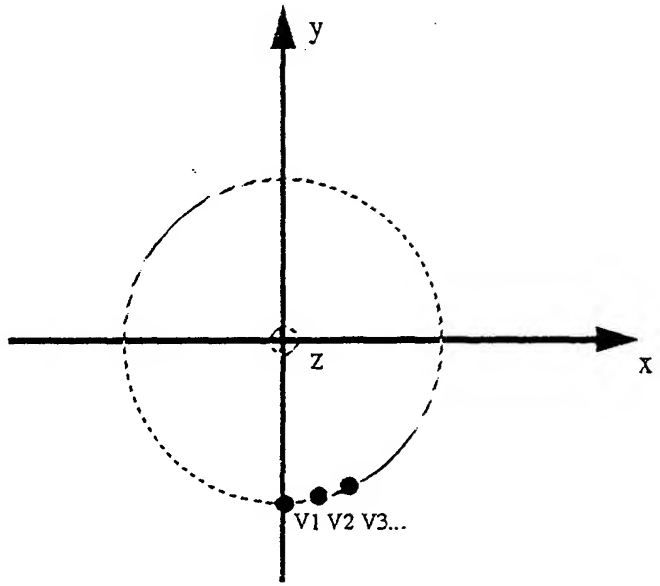


FIG. 9

Unit Disk

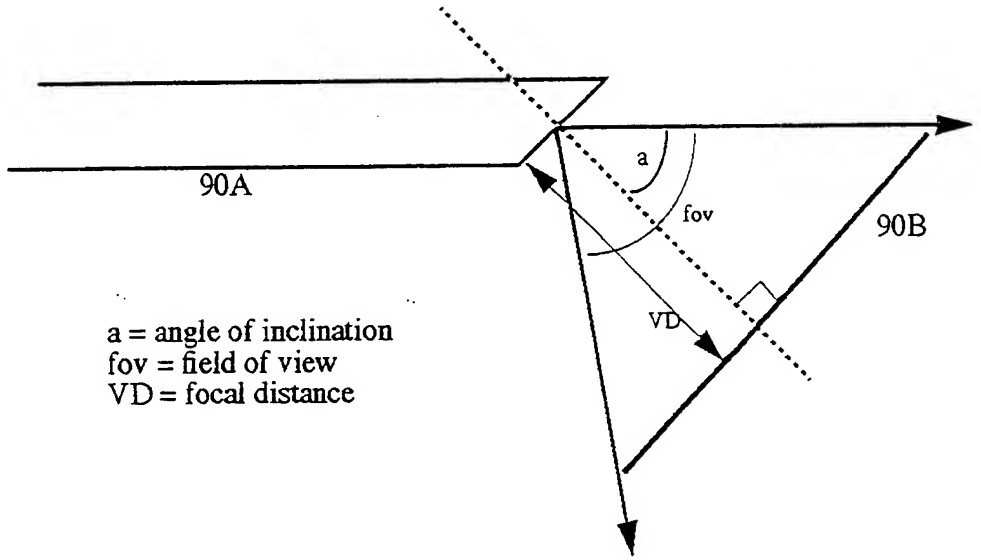
Vertex	xyz	uv
V1	0 -.5 0	.5 .987
V2	.044 -.498 0	.53 .986
V3	.087 -.492 0	.56 .980
...	...	...



This is a schematic representation of a unit disk software object where said disk is defined in the x-y plane and has a diameter of 1.

FIG. 10

Endoscope



This schematic shows how the optical parameters for an endoscope can define the relationship between the endoscope 90A and the disk 90B.

FIG. 11